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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/692,446	10/22/2003	Yiqing Jin	ARC-P132	8012

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EXAMINER	
WANG, CLAIRE X	

ART UNIT	PAPER NUMBER
2624	

DATE MAILED: 10/17/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/692,446	JIN ET AL.	
	Examiner	Art Unit	
	Claire Wang	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *22 October 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-13* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-13* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *22 October 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *10/12/2004*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1,2,4 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Higurashi (US 6,393,162 B1) in view of Yamaguchi et al. (US 2002/0191865 A1).

As to claim 1, Higurashi teaches a method for generating a panoramic image (Col. 1, lines 4-11), comprising: receiving a first image; dividing the first image (Image A, Fig. 3) into a first portion (non comparison region of Image A, Fig. 3) and a second portion (comparison region of Image A, Fig. 3); receiving a second image (Image B, Fig. 3); dividing the second image into a third portion (comparison region of Image B, Fig. 3) and a fourth portion (non comparison region of Image B, Fig. 3); matching an overlapping region between the second portion of the first image and the third portion of the second image (Col. 4, lines 29-36); stitching the second portion of the first image and the third portion of the second image to form a first stitched image (Col. 4, lines 37-40). Higurashi does not teach rotating the first portion of the first image; saving the rotated first portion of the first image in a nonvolatile memory; rotating the first stitched image; and saving the first stitched image in the nonvolatile memory. Yamaguchi et al. (from this point forward shall be referred to as Yamaguchi) teaches of dividing up an

original image into sections (Fig. 8; Paragraph 86, lines 1-3) and rotating each section (Fig. 9B; Paragraph 87 lines 7-9) to achieve a different orientation of the entire image (Fig. 9c), by saving each rotated image into appropriate place in memory (Paragraph 88, lines 1-1-4). This therefore reads on the claimed saving rotated image into nonvolatile memory. Thus, it would have been obvious for one ordinarily skilled in the art at the time of invention to combine the panoramic image generator of Higurashi with the image rotator of Yamaguchi in order to achieve different orientation of an image (Fig. 9B; Paragraph 87 lines 7-9). Further, performing rotation helps to ensure that all of the image portions are in the same orientations.

As to claim 2, Higurashi teaches after said receiving a first image and prior to said dividing the first image, projecting the first image onto a cylinder to warp the first image (cylindrical conversion, Fig. 3); and after said receiving a second image and prior to said dividing the second image, projecting the second image onto the cylinder to warp the second image (cylindrical conversion, Fig. 3).

As to claim 4, Higurashi teaches wherein said matching the second portion of the first image (comparison region of Image A, Fig. 3) and the third portion of the second image (comparison region of Image B, Fig. 3) comprises matching shared features (feature points; Col. 9, lines 65) between the second portion of the first image and a sub-portion of the third portion of the second image (Col. 9, lines 64-66).

As to claim 13, Higurashi teaches receiving a third image (Image C, Fig. 1); dividing the third image into a fifth portion and a sixth portion; matching the fourth portion of the second image and the fifth portion of the third image; stitching the fourth

portion of the second image and the fifth portion of the third image to form a second stitched image; rotating the second stitched image; and saving the second stitched image in the nonvolatile memory (this is the same procedure as claims 1-2, the only difference is the use of a third image, Image C. Higurashi discloses that his image synthesizing apparatus is capable of combining multiple images using the same method mentioned in claims 1-2 (Col. 6, lines 50-55)).

3. Claims 3, 5-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Higurashi (US 6,393,162 B1) in view of Yamaguchi et al. (US 2002/0191865 A1) as applied to claim 4 above, and further in view of Szeliski et al. (US 6,157,747).

As to claim 3, note the discussion of Higurashi in view of Yamaguchi above. Both Higurashi and Yamaguchi do not disclose mapping the image into cylindrical coordinates using the following equation:

$$x' = f \arctan\frac{x}{f}; and$$

$$y' = y \sec\frac{x'}{f};$$

wherein x' and y' are the coordinates of each point on the cylinder, x and y are the coordinates of each points on the first image and the second image, and f is the focus length of the camera. Szeliski et al. (from this point forward shall be referred to as Szeliski) teaches a cylindrical panoramic mapping method, where the camera focal length is known. :

$$\theta = \tan^{-1}(X / Z) \text{ and } v = Y \Big/ \sqrt{X^2 + Z^2}$$

Although it is not the exact equation as the claimed equation it is possible to derive the claimed equation using Szeliski's equation, since both equations uses the camera focal length to solve the issue of cylindrical panoramic mapping. Therefore, it would have been obvious for one ordinarily skilled in the art at the time of invention to combine the panoramic image generator of Higurashi and the image rotator of Yamaguchi with the cylindrical mapping equation of Szeliski in order to warp an image into cylindrical coordinates because of "their sense of construction" (Szeliski Col. 1, lines 45-50). So, both Higurashi and Szeliski are directed to the operations of panoramic images.

As to claim 5, note the discussion of Higurashi in view of Yamaguchi above. Both Higurashi and Yamaguchi do not disclose generating a first level of the second portion of the first image at a first resolution; generating a second level of the third portion of the second image at the first resolution; selecting at least a first feature on the first level of the first image; searching the second level of the second image for the first feature; and matching the first feature between the first layer of the first image and the second layer of the second image to determine a first relative motion between the first image and the second image. Szeliski teaches of an image mosaic method that uses resolution level to match and align adjacent images to form a panoramic image (Col. 18, lines 14-19). Therefore, this reads on the claimed first level of the first image and the second level of the second image. Thus, it would have been obvious for one ordinarily skilled in the art at the time of the invention to have combined the panoramic image generator of Higurashi and the image rotator of Yamaguchi with the resolution level

matcher of Szeliski in order to solve the problem of non-existing detail or the detail may be strongly aliased at coarse resolution levels (Szeliski Col. 18, lines 7-11)

Szeliski also teaches of local motion estimation between pairs of overlapping images (Col. 3, lines 66-67; Col. 4, lines 1-3). This reads on the claimed "determine a first relative motion between the first image and the second image". Therefore, it would have been obvious for one ordinarily skilled in the art at the time of the invention to have combined the panoramic image generator of Higurashi and the image rotator of Yamaguchi with the motion estimation method of Szeliski because it solves the problem of loss of detail or image ghosting from an image (Szeliski Col. 3, lines 66-67).

As to claim 6, note the discussion of Higurashi in view of Yamaguchi further in view of Szeliski above. Szeliski teaches wherein matching shared features between the second portion of the first image and a portion of the third portion of the second image further comprises: matching pixels in the second portion of the first image and the third portion of the second image based on the first relative motion between the first image and the second image (Fig. 25B; Col. 27, lines 10-15).

As to claim 7, note the discussion of Higurashi in view of Yamaguchi further in view of Szeliski above. Szeliski teaches wherein matching shared features between the second portion of the first image and a portion of the third portion of the second image further comprises: generating a third level of the second portion of the first image at a second resolution that is greater than the first resolution (coarse-to-fine process, where the use of 3 to 4 pyramid levels are used; Col. 18, lines 1-7); generating a fourth level of the third portion of the second image at the second resolution (coarse-to-fine process,

where the use of 3 to 4 pyramid levels are used; Col. 18, lines 1-7); selecting at least a second feature on the third level of the first image (locating feature points; Col. 21, lines 1-6); searching an area on the fourth level of the second image for the second feature, wherein the area is selected based on the relative motion between the first image and the second image (Patch j is found based on the motion vector between images I_m, I_l and I_k; Fig. 23); matching the second feature between the third level and the fourth level to determine a second relative motion between the first image and the second image (deghosting method computes the motion/flow between all pairs of images; Col. 25, lines 24-26); and matching pixels in the second portion of the first image and the third portion of the second image based on the second relative motion between the first image and the second image (Fig. 25B; Col. 27, lines 10-15).

4. Claims 8-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Higurashi (US 6,393,162 B1) in view of Yamaguchi et al. (US 2002/0191865 A1) as applied to claim 4 above, and further in view of Teo (US 6,385,349 B1).

As to claim 8, note the discussion of Higurashi in view of Yamaguchi above. Both Higurashi and Yamaguchi do not disclose wherein said stitching the second portion of the first image and the third portion of the second image comprises: determining a minimum color difference path in the overlapping region; filling a first side of the minimum color difference path with color values from the first image; and filling a second side of the minimum color difference path with color values from the second image. Teo teaches a method of merging the images by combining the respective pixel

color values in the overlap regions (Col. 8, lines 29-31) using a technique known as "feathering". The technique feathering computes a weighted combination of pixel values of image A and image B in the overlap region (Col. 8, lines 40-47). This technique will allow minimization of deviation between the color intensities of the two images. Thus the feathering technique of Teo reads on the claimed invention. Therefore, it would have been obvious to one ordinarily skilled in the art at the time of the invention was made to have combined the feathering technique of Teo with the panoramic image generator of Higurashi and the image rotator of Yamaguchi in order to minimize the lighting difference between two images (Teo, Col. 9, lines 25-26)

As to claim 9, note the discussion of Higurashi in view of Yamaguchi above further in view of Teo. Teo teaches further comprising blending the overlapping region if a color difference between the first side and the second side of a scan line is less than a threshold (Teo teaches of combining the two images by taking weighted average of the pixel color value within a certain range; claim 1) comprising: blending the color values of the first image and the second image along a blending width of the minimum color difference path (weighted average of the pixel color values; claim 1).

As to claim 10, note the discussion of Higurashi in view of Yamaguchi above further in view of Teo. Teo teaches wherein said blending the color values of the first image and the second image comprises: adjusting the color values of the first image and the second image along the blending width using a value C(x) (adjusting the pixel color values of at least one of the overlapping images to produce a whole image; Col. 3, lines 52-55)defined by: 9 C (x) = d ij 2 .times. (1 - x W / 2), where C(x) is the color

value to be added to or subtracted from a pixel located x away from pixel (i,j) on the minimum color difference path, d.sub.ij is the color difference of pixel (i,j), and W is the blending width (although this exact formula is not disclosed by Teo, it is easily derivable due to the fact that Teo discloses all of the elements within the formula).

As to claim 11, note the discussion of Higurashi in view of Yamaguchi above further in view of Teo. Teo teaches wherein the value C(x) is (1) added to the color values of the first image and subtracted from the second image or (2) subtracted from the color values of the first image and added to the second image (Teo teaches of an adjusting step that adjusts the pixel color value of at least one of the digital images in a pixel region that includes the overlapping pixel region; Col. 3, lines 60-63).

As to claim 12, note the discussion of Higurashi in view of Yamaguchi above further in view of Teo. Teo teaches wherein the width is the largest integer 2.sup.n that is less than the width of the second portion of the first image and division operations in calculating the parameter C(x) comprises shift operations (Fig. 1).

Conclusion

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Edwards (US 6,978,051 B2) teaches a system and method for capturing adjacent images by using panorama mode.

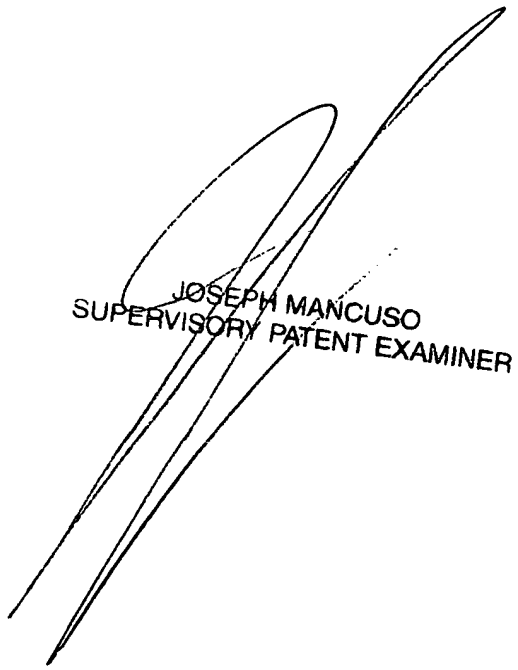
Szeliski et al. (US 6,097,854) teaches an image mosaic construction system with patch-based alignment.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Claire Wang whose telephone number is 571-270-1051. The examiner can normally be reached on 5/4/9.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Joseph Mancuso can be reached on 571-272-7695. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Claire Wang
9/29/2006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